Chapter 2
Natural Resources:
Opportunities and Constraints

2. NATURAL RESOURCES: OPPORTUNITIES AND CONSTRAINTS

Cary has a strong interest in protecting its vital natural resources. This chapter presents a brief inventory of the environmental characteristics that were evaluated in developing the Land Use Plan. However, a full-scale evaluation of the environmental impacts of growth is not within the scope of this plan. A more detailed consideration of natural resources is presented in the internal staff document Cary's Natural and Historic Resources, prepared as background material for the Land Use Plan. Cary's Natural and Historic Resources will serve as the starting point for the development of a Natural and Historic Resources Element, to be included in Cary's Comprehensive Plan.

2.1 Regional Geology, Soils and Steep Slopes

A region's landforms and drainage are the result of an interplay between the underlying geology and climate. The Town of Cary overlies the boundary between two distinct geologic provinces, the Durham Basin in the west, made up largely of sedimentary rocks (i.e., sandstones, siltstones and shales) with igneous intrusions of varying size and composition (i.e., basalt, andesite, and other rocks formed directly from molten material), and in the east North Carolina's Piedmont, consisting of metamorphic and metasedimentary rocks of varying composition (i.e., schist, phyllite, and other rocks formed from chemical alteration by heat and pressure), also intruded by igneous rocks. A third physiographic province, North Carolina's upper Coastal Plain, lies near Cary, its boundary lying just south of, and roughly parallel to, Middle Creek.

Cary's landscape consists primarily of gently to moderately sloping low hills separated by relatively narrow, v-shaped valleys, although broader, u-shaped valleys predominate to the west. Steep slopes are uncommon, although two significant clusters of steep slopes occur in west Cary. The first of these is a large area to the west of N.C. 55 and north of Green Hope School Road. The other cluster forms a belt roughly paralleling N.C. 55 near Research Triangle Park (See Figure 2.1).

Generally, soils around Cary function well as absorption fields for septic systems and present few problems for construction, such as high shrink-swell potential. However, soils in the west, particularly at the western edge of Wake County and in Chatham County, tend to function poorly as absorption fields and have a high shrink-swell potential. Very large lot sizes for residential and other development are therefore necessary in the part of the Chatham County Study Area beyond the future urban services boundary[1], since the area will not be served by municipal sewer. Special care in designing buildings is also necessary to avoid cracked foundations and other problems associated with plastic soils.

Six soil associations occur within Cary and its surrounding area. These, and their associated limitations, are discussed below. (For a more detailed description of soils within the

[1] The *urban services boundary* is defined in Chapter 8, Section 8.3.

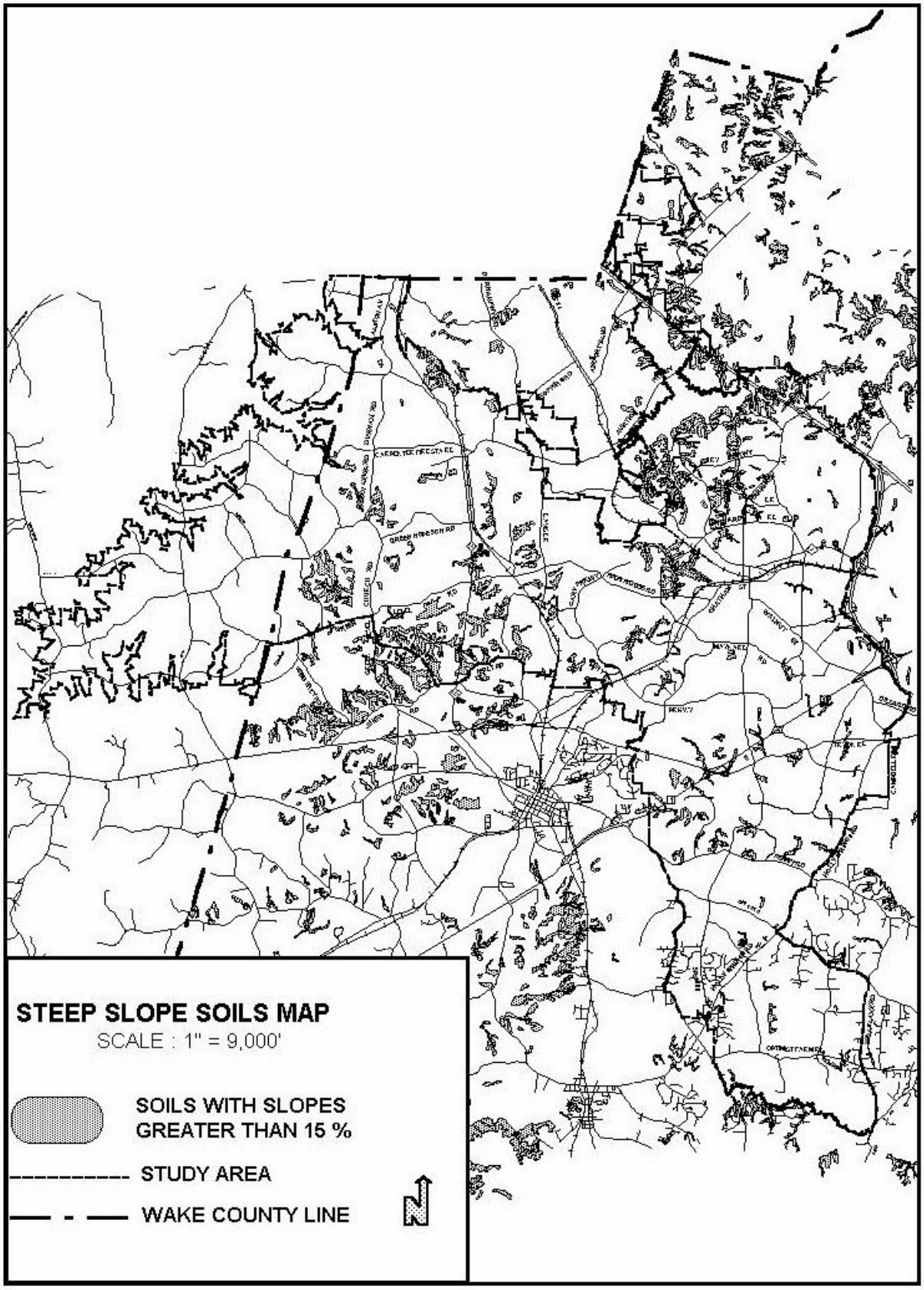
STEEP SLOPE SOILS MAP
SCALE : 1" = 9,000'
SOILS WITH SLOPES GREATER THAN 15 %
STUDY AREA
WAKE COUNTY LINE

FIGURE 2.1

region, the reader is referred to the Soil Survey for Wake County, published by the U.S. Department of Agriculture.)

Appling Soils: Occurring most commonly in the southern and southeastern areas of the Town, these deep, well-drained soils were formed under forest cover from weathered granite, schist, and gneiss. Infiltration of water into these soils is good and surface runoff is moderate. Their susceptibility to erosion is moderate with a shrink-swell potential ranging from good to moderate. They have no limitations for road construction or as support for building foundations.

Cecil Soils: Deep, well-drained soils formed from weathered metamorphics, these soils occur primarily in eastern Cary. Cecil soils have moderate limitations as absorption fields for septic systems, but are well suited for roadway construction and building foundations.

Cecil-Appling Soils: Cecil-Appling soils occupy the central portion of Cary. These soils are generally, deep, well-drained soils formed from weathered metamorphic rocks. Cecil-Appling soils are prone to erosion problems and have moderate limitations as absorption fields for septic tanks. However, they have no limitations for roadway construction or foundations.

Creedmoor-White Store Soils: Occurring primarily to the west of Cary in the Durham Basin, these soils are derived from weathered sedimentary rocks, such as sandstone and shale. Limitations include susceptibility to erosion, severe limitations as absorption fields for septic tanks, high shrink-swell potential, and a plastic subsoil which renders them unsuitable for road construction and as support for building foundations without special engineering.

Herndon-Georgeville Soils: Herndon-Georgeville soils occur in a narrow, north-south trending band in western Cary. They are derived from weathered phyllite, a metamorphic rock associated with the Carolina Slate Belt. These soils are susceptible to erosion and have moderate limitations as absorption fields for septic tanks. Otherwise, they present few limitations for development.

Mayodan-Granville-Creedmoor Soils: These soils occur to the southwest of Cary, primarily in the vicinity of the Town of Apex and its surrounding area. As with Creedmoor-White Store soils, they formed from weathered sedimentary rocks associated with the Durham Basin. In some places, these soils place severe limitations on septic systems. Another potential problem is high clay content in the subsoil, which in many cases makes the soil plastic and unsuitable for roadway construction and building foundations.

2.2 Water Supply Watersheds

A *watershed* is a topographic drainage basin, where [rain]water drains to a common destination. The Land Use Plan Study Area covers five different watersheds, as shown in Figure 2.2. A *water supply watershed* is any watershed that serves as a source for a municipally owned water supply intake. Currently, one water supply watershed (or reservoir watershed) lies near the jurisdiction of Cary. The Jordan Lake Reservoir, a U.S. Army Corps of Engineers (COE) multi-use facility, provides public water for the Town. Currently, the Town is allotted 16 million gallons per day (MGD) from Jordan Lake, with an emergency allocation of 19.1 MGD. On peak usage days, demand has occasionally exceeded plant capacity, with the excess demand being met by purchasing water capacity from Raleigh and/or Durham.

The Swift Creek Watershed, which is expected to become a source for public drinking water for the southeastern areas of Wake County, lies partially within the Town's jurisdiction. Cary has agreed not to expand further into the Swift Creek Watershed, and the portion of the watershed within the Town's jurisdiction has been designated as a Reservoir Watershed Protection District, with restrictions on development density. A large portion of the Swift Creek floodplain to the east of Regency Parkway has been set aside as conservation and recreational land, including Hemlock Bluffs State Park, Lochmere Park, and Lochmere Golf Course. However, north of Regency Parkway, Swift Creek flows through heavily urbanized lands, including the office and commercial employment center adjacent to U.S. Highway 1, near the U.S. 64 interchange.

Streams, rivers, and lakes in North Carolina are assigned one or more surface water classifications by the state and federal governments, with each classification assigned a particular set of protection standards. Under the N.C. Department of Environmental Management (DEM) classification system, Jordan Lake is classified as WS-IV waters, a classification assigned to moderately to highly developed watersheds with a large number of permitted waste water dischargers. Local programs to control nonpoint source pollution and stormwater discharge of pollution are required within a critical area determined by the N.C. Environmental Management Commission. The area defined as a WS-IV protected area extends five miles from the normal pool elevation of Jordan Lake (i.e., 216 feet above mean seal level). Swift Creek is currently classified as WS-III waters, a classification extended to low to moderately developed watersheds.

Cary recognizes that maintenance of a potable water supply is crucial in safeguarding the health of its citizens and ensuring long-term economic prosperity. A "Critical Water Quality Area" has been established for the Jordan Lake Watershed which designates a one-mile buffer around the lake for lands not under COE jurisdiction and places certain restrictions on development within the watershed. It is established Town policy not to extend water and sewer services into the one-mile buffer, which presents a limitation on development densities in the area in addition to the previously discussed soil limitations.

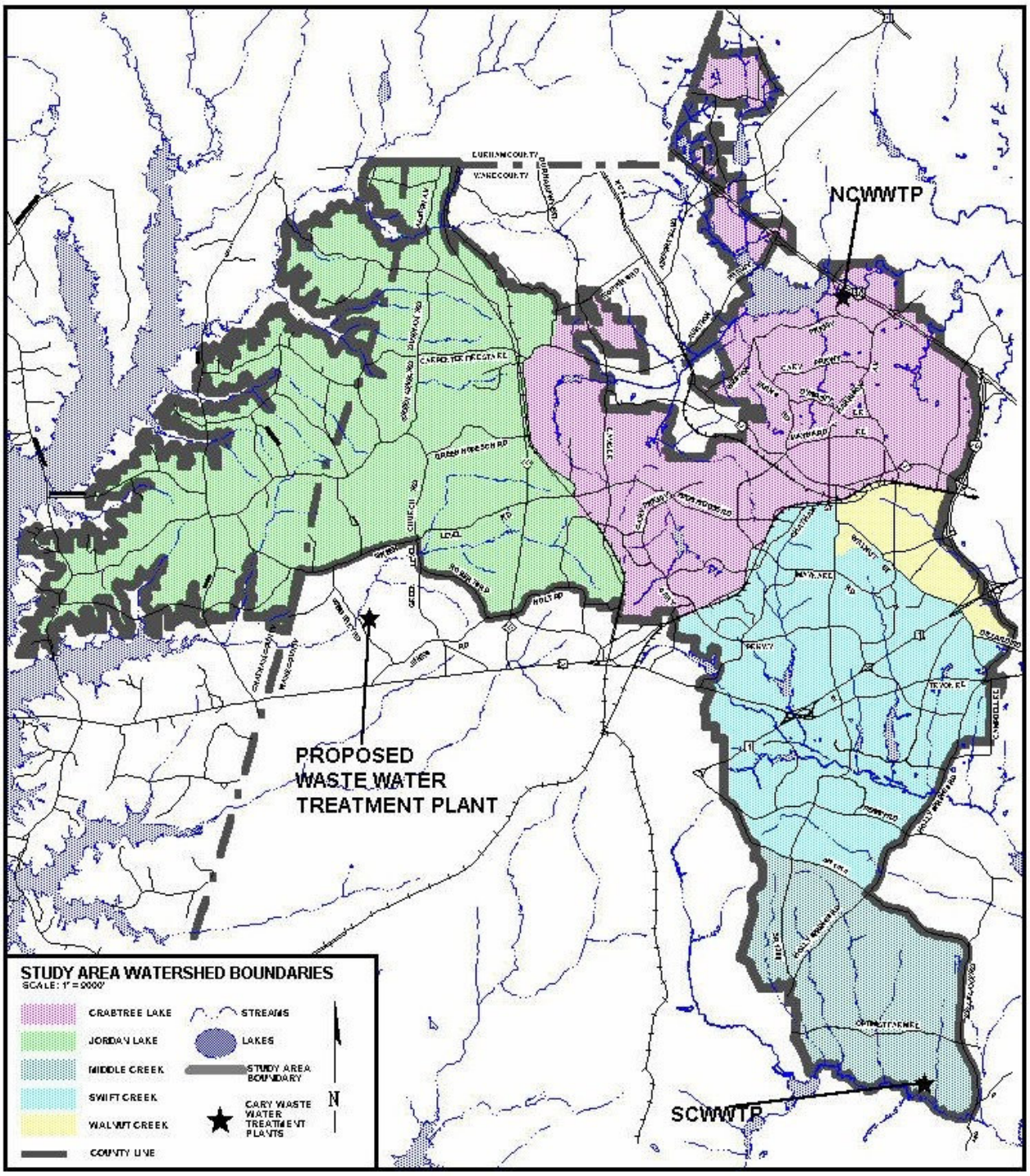
NCWWTP
PROPOSED
WASTE WATER
TREATMENT PLANT
SCWWTP
STUDY AREA WATERSHED BOUNDARIES
SCALE: 1" = 2000'
CRABTREE LAKE
JORDAN LAKE
MIDDLE CREEK
SWIFT CREEK
WALNUT CREEK
COUNTY LINE
STREAMS
LAKES
STUDY AREA BOUNDARY
CARY WASTE WATER TREATMENT PLANTS
N

FIGURE 2.2

In addition to current development requirements within the Critical Water Quality Area (summarized in Cary's Natural and Historic Resources), the Town may, at some point in the future, wish to establish more stringent buffer requirements for streams in the area, particularly if water quality in the Jordan Lake reservoir declines due to increasing development within the watershed.

The provision of adequate public water for future growth is a primary concern of Cary. The Town's Water System Report, prepared in 1992, proposes the following projects, necessary to provide an adequate supply of water for Cary's growing population:

Year		Project
2003		Expansion of treatment plant to 18.0 MGD*
2012		Expansion of treatment plant to 36.0 MGD
2020 to buildout		Expansion of treatment plant to 54.0 MGD

*Millions of gallons per day.

For more information on these and other proposed water system improvements, refer to the Water System Report.

The 1992 report relied on population projections that have proved overly conservative: The rate of population growth in Cary exploded in the 1990's, resulting in current peak day water demands in 1996 that require the capacity originally planned for by the year 2003. An updated Water System Report, using new population forecasts, should be prepared and incorporated into the Community Facilities Element of the Comprehensive Plan. The updated report should also project total water demand based on the anticipated future pattern of land uses, and total acreage by land use category, as given by this Plan (see esp. Chapter 4 and the Land Use Plan Map). (The 1992 Report projected daily water usage per acre based on existing zoning within the town's boundaries, and expected zoning classifications within other parts of the study area, rather than on the basis of planned future uses.)

2.3 Floodplains and Wetlands

Floodplains are the low, relatively flat-lying areas adjacent to streams that are subject to flooding during periods of intense rainfall. Associated with floodplains are often riverine wetlands, which function as storage areas for flood waters, slowing runoff and thereby lessening flood levels downstream. These wetlands also serve as areas of deposition for sediment and other material carried by flood waters.

Area streams tend to have relatively narrow floodplains, although broader floodplains are associated with several significant local streams, including Crabtree Creek, Swift Creek, Middle Creek, and White Oak Creek (See Figure 2.3). Riverine wetlands are associated with each of these floodplains and are common throughout the area.

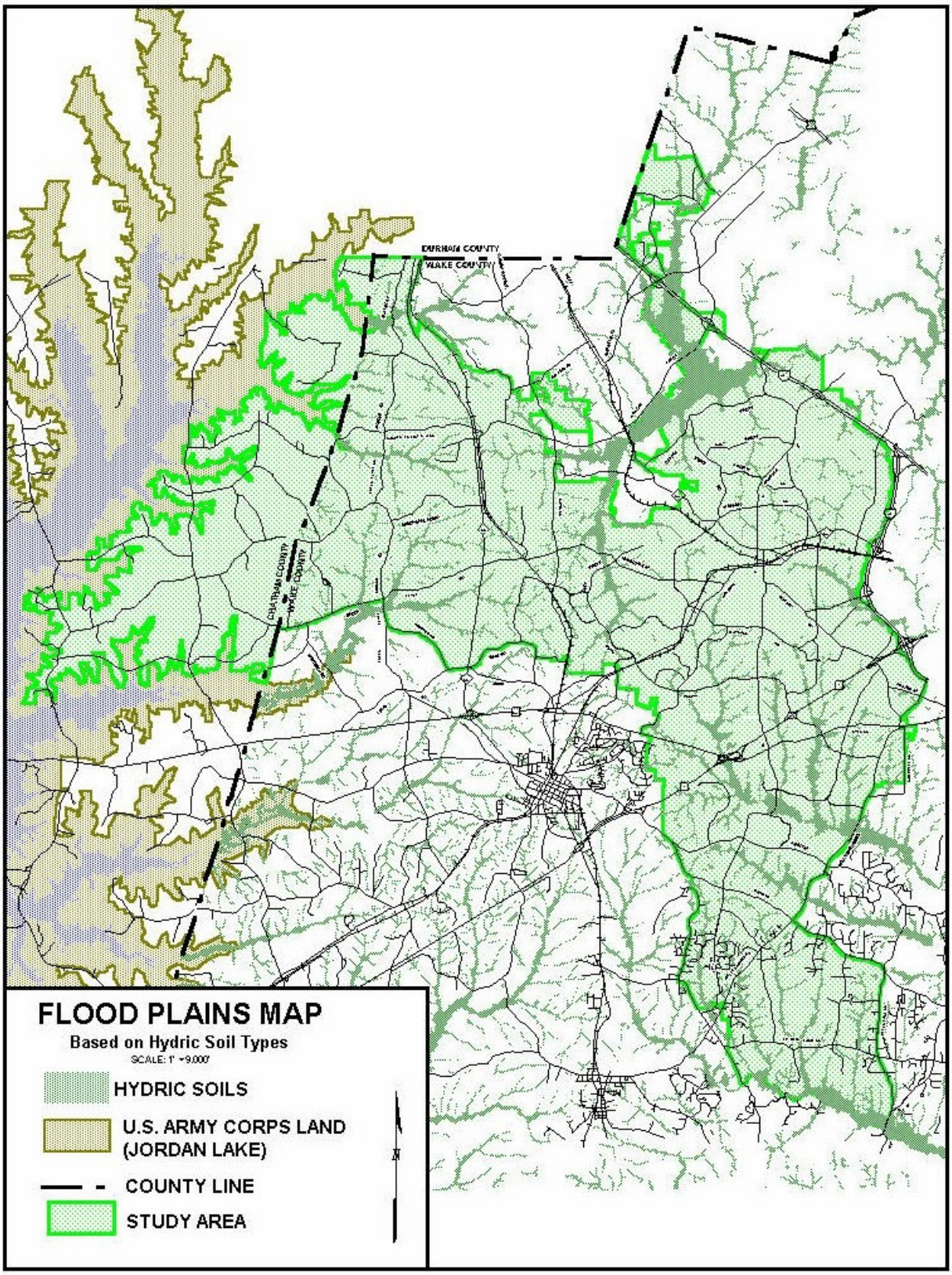
DURHAM COUNTY
WAKE COUNTY
CHATHAM COUNTY
WAKE COUNTY
FLOOD PLAINS MAP
Based on Hydric Soil Types
SCALE: 1" =9,000'
HYDRIC SOILS
U.S. ARMY CORPS LAND
(JORDAN LAKE)
COUNTY LINE
STUDY AREA
N

Figure 2.3

Construction within floodplains, particularly when riverine wetlands are damaged or destroyed, can lessen the storage capacity of floodplains, contribute to higher flood levels downstream, increase turbidity, and increase erosion problems due to higher streamflow velocities. For these reasons, Cary places severe limitations on development within the 100-year floodplain.[2] No encroachment is allowed unless a registered engineer, architect or landscape architect certifies that the encroachment will not increase flood levels above FEMA regulatory levels.

The Clean Water Act regulates development within wetlands and requires a permit, issued by the COE, prior to any dredge or fill carried out in isolated wetlands above one acre in size (isolated wetlands include any wetlands not adjacent to navigable waterways). These include the riverine wetlands commonly associated with streams in Cary and the surrounding area. Landowners who are contemplating land-disturbing activities within local floodplains are advised to carefully inspect the site for indications of water at or near the surface, refer to available soils surveys and National Wetland Inventory (NWI) maps, and seek preliminary advice from the COE.

2.4 Abandoned Hazardous Waste Sites

Prior to the 1970s, few controls were in place to control the discharge of hazardous materials into the environment. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 was adopted to regulate hazardous waste disposal and the cleanup of abandoned sites on a national level. In addition, North Carolina passed the Inactive Hazardous Sites Response Act in 1987 to establish a program which identifies, assesses, and remedies hazardous waste disposal sites not addressed by other programs. Currently, approximately 1,000 sites have been identified nationwide.

According to the 1996 annual "Inactive Hazardous Waste Sites Report" to the North Carolina General Assembly, there are currently no inactive hazardous waste sites in Cary identified on the federal "Sites Priority List." However, the "Old State Lab" site, owned by North Carolina State University, is identified on the "Sites with Evaluations Pending" list. This site, approximately 278 acres in size, is bounded on three sides by Chatham Street, I-40, and Cary Towne Boulevard, respectively.

The state maintains several lists of inactive hazardous waste sites in addition to the Sites Priorities List and the Sites Pending List. These include: (1) a list identifying properties for which notices of inactive waste disposal sites have been filed with the county register of deeds; (2) sites directly under the jurisdiction of the N.C. Division of Environmental Management; and (3) sites requiring no further action. The list of sites requiring no further action generally includes sites for which cleanup has been completed.

[2] The 100-year floodplain defines the elevation that floodwaters would reach in a storm event that has a 1-in-100 chance of occurring in any given year.

The current lists of properties giving notice to the register of deeds and sites under direct jurisdiction of the state include Austin Foods, located at 511 East Chatham Street. Soil and groundwater in the western portion of the site are contaminated by pesticides and heavy metals. Cary staff contact with the North Carolina Division of Solid Waste Management revealed that groundwater and soil in this area have also been contaminated by hydrocarbons leaking from an underground storage tank at another nearby site. Cleanup of the Austin Foods site is currently under the jurisdiction of the North Carolina Division of Water Quality. For further information on hazardous waste sites, the reader should contact the North Carolina Division of Solid Waste Management at (919) 733-4996. (See Figure 2.4)

2.5 Rare, Threatened and Endangered Species

Plants and animals threatened with extinction are protected under federal and state endangered species legislation. This guardianship is not limited to protection of the species against direct physical harm but also includes protection of habitat critical to the species' survival. Penalties for knowingly violating these regulations can be severe, including fines up to $12,000 per violation in cases involving federal endangered species.

The state of North Carolina maintains countywide inventories of rare, threatened, and endangered species. It should be noted that species included on the state list may be rare or threatened with extinction within the state but may not be threatened in other parts of its range. The following list, provided by the Natural Heritage Program in September of 1996, identifies threatened and endangered species that occur in Wake County. Species on the federal list of threatened and endangered species are identified with an asterisk:

Vertebrates	**Status**
Tiger salamander, *Ambystoma tigrinum*	threatened
Bald eagle, *Haliaetus leucocephalus*	threatened*
Red-cockaded woodpecker, *Picoides borealis*	endangered*
Invertebrates	
Dwarf wedgemussel, *Alasmidonta heterodon*	endangered*
Triangle floater, *Alasmidonta undulata*	threatened
Yellow lance, *Elliptio lancelata*	threatened
Roanoke slabshell, *Elliptio roanokensis*	threatened
Atlantic pigtoe, *Fusconaia masoni*	threatened
Green floater, *Lasmigona subvirdis*	endangered
Squawfoot, *Strophitus undulatus*	threatened
Vascular plants	
Piedmont Quilwort, *Isoetes piedmontana*	threatened
Small portulaca, *Portulaca smallii*	threatened
Low wild-petunia, *Ruellia humilis*	threatened
Carolina least trillium, *Trillium pusillum*	endangered

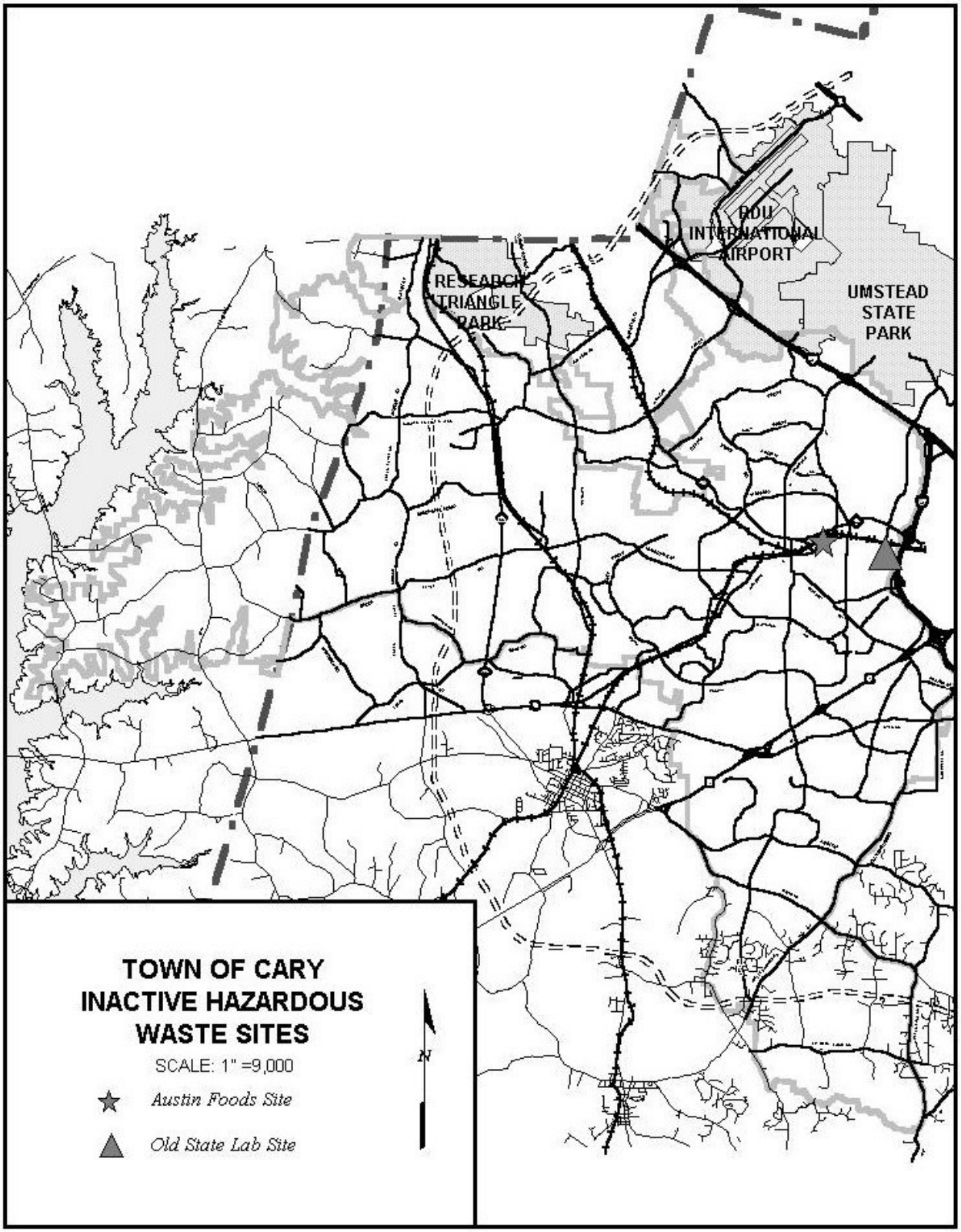
RDU
INTERNATIONAL
AIRPORT
RESEARCH
TRIANGLE
PARK
UMSTEAD
STATE
PARK
TOWN OF CARY
INACTIVE HAZARDOUS
WASTE SITES
SCALE: 1" =9,000
Austin Foods Site
Old State Lab Site
N

FIGURE 2.4

Several of these species occur in areas of western Wake County and eastern Chatham County likely to be developed over the next several decades. The Town of Cary supports the preservation of rare, threatened, and endangered species and will work with North Carolina's Natural Heritage Program and landowners to ensure that vital plant and animal habitats are protected as development occurs.

2.6 Agriculture and Forestry

Most agricultural land uses in Cary and the surrounding study areas occur to the west of N.C. 55, with centers in the Green Level and Carpenter communities, and the Upper Middle Creek area. Currently established incentives have not been adequate to slow the conversion of agricultural lands to suburban land uses, and it has been estimated that Wake County has lost 50 percent of its agricultural land since 1970. Under present policies, it is likely that suburbanization will continue between Cary's current limits and the Chatham County line. Agricultural land in the Upper Middle Creek Study Area, under the jurisdiction of Wake County, is rapidly converting to large-lot residential subdivisions despite incentives for rural preservation and a lack of public water and sewer services. Without additional measures to slow conversion of agricultural lands, this trend is likely to continue. The Plan strives to ensure that development proceeds in an orderly manner outward from the urban center and not as sprawling, isolated patches of suburban development. This should help to slow the pace of agricultural land conversion.

The natural vegetative cover for Wake County consists primarily of mixed coniferous and broadleaf forest. Unless removed for agriculture, these mixed forests predominate throughout surrounding rural areas and may also be seen in many of the undeveloped parcels within Cary, including formerly cleared lands that have reverted to forest. Additionally, full tree canopies are common in the older existing residential neighborhoods within Cary.

Forests provide a number of "quality of life" benefits for Cary. For example, the conversion of large tracts of forest to paved surfaces and grass lawns can have profound impacts on urban micro-climates, causing summer temperatures to be higher and winter temperatures to be lower. For a number of reasons, this micro-climatic effect is also linked to declining air quality. Forests also provide habitat for wildlife and selected sites may serve the community as parks, greenways, and recreational areas. Forested buffers protect water quality in local streams by slowing stormwater runoff and removing nutrients, sediment, and other pollutants, and can also be used as a buffer or screen between incompatible land uses. Finally, trees provide an important urban amenity by enhancing the beauty and overall attractiveness of a community, thereby contributing to overall land value.

Much of the recent construction in Cary has shown less regard for tree preservation and replanting than earlier development. For example, the preservation of mature trees as an urban and neighborhood amenity was a key feature of older subdivisions, such as Farmington Woods, Kildaire Farms, and Greenwood Forest. Houses were built in these subdivisions with a minimal

amount of clearing -- little more than was needed for the dwelling foundations. This type of careful tree preservation has become increasingly rare in the last decade.

Significantly large areas of impervious surface currently occur as commercial strips along (1) Kildaire Farm Road, between Maynard Drive and the Cary Parkway, and also just south of U.S. 1, (2) at the U.S. 1 and Walnut Street interchange, where two major shopping centers occur, and (3) at Maynard Drive and Cary Towne Boulevard. In addition, suburban development, particularly in western Cary, is rapidly removing rural forest cover. It is therefore strongly recommended that current regulations and guidelines regarding tree removal and replanting be revised in order to ensure that the community's natural beauty is preserved.

However, reason should prevail when considering new tree preservation requirements. In some cases the cost of preserving a specimen tree is excessive compared to the benefits derived from replanting. This is particularly true in cases where full forest canopies are removed with the exception of a few large trees, because forest trees rarely have attractive canopies when viewed in isolation. In such cases, replanting with attractive native species, such as oak, sweetgum, elm, or maple may be preferable because these will grow into attractive, large trees with full canopies.